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Periodontal Health Among University Students: A Cross-Sectional Study of the Association Between Stress, Oral Hygiene Practices, and Disease Prevalence

Karima Alfitory Ahmed[a], Khyria Dhaw Omar[b], Basma Ali [c], Najwa Awn[d], Mariam Alsherif[e], Rasha Ibrahim[f], Neaima Alhendawi[g]

[a]Oral pathology department, faculty of Dentistry's, University of Sirt, Sirte, Libya.
[b]Periodontology department, faculty of Dentistry's, University of Sirt, Sirte, Libya.
[c]Oral pathology department, faculty of Dentistry's, University of Tripoli, Tripoli, Libya.
[d]Conservative department, faculty of Dentistry's, University of Althadi, Tripoli, Libya.
[e]Oral pathology department, faculty of Dentistry's, University of Benghazi, Benghazi, Libya.
[f]Preventive department, faculty of Dentistry's, University of Sirt, Sirte, Libya.
[g]Oral pathology department, faculty of Dentistry's, University of Benghazi, Benghazi, Libya.

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ABSTRACT

Periodontal disease remains a significant health issue, particularly among young adults. The impact of psychological factors such as stress on oral health is increasingly recognized, yet limited studies have explored this association in the university student population. Our objective was to investigate the relationships between stress levels, oral hygiene behaviors, and the prevalence of periodontal disease among university students. A cross-sectional study was conducted with 675 university students. Demographic data, perceived stress levels (using the Perceived Stress Scale), smoking status, and oral hygiene behaviors (including frequency of brushing and flossing) were collected through self-reported questionnaires and clinical examinations. The prevalence of gingivitis and periodontitis was assessed, and statistical analyses were performed to identify correlations between stress levels and oral health outcomes. The results indicated that 50% of participants exhibited signs of periodontal disease, with a higher prevalence among those with poor oral hygiene practices. Students with high stress levels reported significantly poorer oral hygiene behaviors, including less frequent brushing (45% brushed less than twice daily) and increased neglect of dental visits (60%). Additionally, smoking compounded the effects of stress, with smokers experiencing a 75% prevalence of periodontal disease under high-stress conditions.This study shows that periodontal disease is common among university students and is strongly associated with high stress levels and poor oral hygiene practices. Students experiencing higher stress were more likely to neglect oral care and dental visits, increasing their risk of disease. Smoking further worsened periodontal health, especially in stressed individuals. These findings highlight the importance of promoting good oral hygiene, stress management, and smoking cessation to improve periodontal health in this population.

صحة اللثة لدى طلاب الجامعة: دراسة مقطعية للعلاقة بين الضغط النفسي، وممارسات نظافة الفم، و انتشار المرض

كريمة الفيتوري أحمد [a]، خيرية ضو عمر [b]، بسمة علي [c]، نجوى عون [d]، مريم الشريف [e]، رشا إبراهيم [f]، نعيمة الهنداوي [g]

[a] قسم أمراض الفم، كلية طب الأسنان، جامعة سرت، سرت، ليبيا.
[b] قسم أمراض اللثة ، كلية طب الأسنان، جامعة سرت، سرت، ليبيا.
[c] قسم أمراض الفم، كلية طب الأسنان، جامعة طرابلس، طرابلس، ليبيا.
[d] قسم العلاج التحفظي، كلية طب الأسنان، جامعة التحدي، طرابلس، ليبيا.
[e] قسم أمراض الفم، كلية طب الأسنان، جامعة بنغازي، بنغازي، ليبيا.
[f] قسم طب الأسنان الوقائي، كلية طب الأسنان، جامعة سرت، سرت، ليبيا.
[g] قسم أمراض الفم، كلية طب الأسنان، جامعة بنغازي، بنغازي، ليبيا.

*Corresponding author:
E-mail addresses: karima.alfitory@su.edu.ly
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الملخص

الخلفية: لا تزال أمراض اللثة تشكل مشكلة صحية كبيرة، وخاصة بين الشباب. يتم التعرف بشكل متزايد على تأثير العوامل النفسية مثل التوتر على صحة الفم، إلا أن دراسات محدودة استكشفت هذا الارتباط بين طلاب الجامعات. **الهدف :** التحقيق في العلاقات بين مستويات التوتر وسلوكيات نظافة الفم وانتشار أمراض اللثة بين طلاب الجامعات. **المواد والطرق:** أجريت دراسة مقطعية مع 675 طالبًا جامعيًا. تم جمع البيانات الديموغرافية ومستويات التوتر المتصورة (باستخدام مقياس التوتر المتصور) وحالة التدخين وسلوكيات نظافة الفم (بما في ذلك تكرار تنظيف الأسنان بالفرشاة وخيط تنظيف الأسنان) من خلال استبيانات ذاتية الإبلاغ وفحوصات سريرية. تم تقييم انتشار التهاب اللثة والتهاب دواعم السن، وتم إجراء تحليلات إحصائية لتحديد الارتباطات بين مستويات التوتر ونتائج صحة الفم. **النتائج:** أشارت النتائج إلى أن 50٪ من المشاركين أظهروا علامات أمراض اللثة، مع انتشار أعلى بين أولئك الذين لديهم ممارسات نظافة فموية سيئة. أفاد الطلاب الذين يعانون من مستويات عالية من التوتر بسلوكيات نظافة الفم السيئة بشكل ملحوظ، بما في ذلك تنظيف الأسنان بشكل أقل تكرارًا (45%) ينظفون أسنانهم أقل من مرتين يوميًا) وإهمال متزايد لزيارات طبيب الأسنان (60%). بالإضافة إلى ذلك، أدى التدخين إلى تفاقم آثار التوتر، حيث يعاني المدخنون من انتشار أمراض اللثة بنسبة 75% في ظل ظروف عالية التوتر. **الخلاصة** :تُظهر هذه الدراسة أن أمراض اللثة شائعة بين طلاب الجامعات وترتبط بشكل كبير بارتفاع مستويات التوتر وضعف ممارسات نظافة الفم. كما أن الطلاب الذين يعانون من مستويات أعلى من التوتر كانوا أكثر عرضة لإهمال العناية بصحة الفم وزيارات طبيب الأسنان، مما يزيد من خطر الإصابة بالمرض. بالإضافة إلى ذلك، يؤدي التدخين إلى تفاقم صحة اللثة، خاصة لدى الأفراد الذين يعانون من التوتر. وتؤكد هذه النتائج على أهمية تعزيز ممارسات نظافة الفم الجيدة، وإدارة التوتر، والإقلاع عن التدخين لتحسين صحة اللثة لدى هذه الفئة.

الكلمات المفتاحية:

أمراض دواعم الأسنان

الضغط النفسي

نظافة الفم

طلاب الجامعة

التدخين

التهاب اللثة.

1. Introduction

Periodontal health is a fundamental component of overall oral health and is influenced by multiple factors, including oral hygiene practices, genetic predisposition, and lifestyle behaviors such as smoking and diet. In recent years, increasing attention has been directed toward the prevalence of periodontal disease among university students, a population exposed to unique stressors related to academic demands, lifestyle transitions, and potential limitations in access to dental care (1). Emerging evidence suggests that psychological stress is associated with adverse oral health outcomes, including periodontal disease, as it may contribute to neglect of oral hygiene and the adoption of harmful habits such as smoking (2, 3). Stress is recognized as an important risk factor in the development and progression of periodontal disease. Chronic psychological stress can impair immune function, increasing susceptibility to infections, including those affecting periodontal tissues (4). Additionally, stress may enhance inflammatory responses, thereby accelerating periodontal tissue destruction (5). Among university students, periods of heightened academic pressure, such as examinations, are often accompanied by poor oral hygiene practices and irregular dental visits, further increasing the risk of periodontal disease (6). Periodontal disease remains one of the most prevalent oral health conditions worldwide, affecting approximately 10–15% of the global population, with higher rates observed in certain groups (7).It is characterized by inflammation of the supporting structures of the teeth, which may lead to gingival bleeding, recession, and, in advanced stages, tooth loss. Clinically, periodontal disease is classified into gingivitis, a reversible inflammatory condition, and periodontitis, a more severe and irreversible form. While dental plaque accumulation due to inadequate oral hygiene is the primary etiological factor, systemic and behavioral factors, including stress, play a significant contributory role (8).University students represent a particularly vulnerable group due to the combination of increased psychological stress and suboptimal oral health behaviors. For many students, university life marks a transition to greater personal responsibility for health maintenance. However, factors such as irregular daily routines, financial limitations, and academic priorities may lead to neglect of oral hygiene (9). Moreover, exposure to psychological stressors, including academic workload and social pressures, may further compromise oral health (10) The relationship between stress and periodontal health is complex and involves both biological and behavioral pathways. Physiologically, stress can alter immune responses and increase the production of pro-inflammatory cytokines, such as interleukin-1 beta (IL-1β) and tumor necrosis factor-alpha (TNF-α), which are implicated in periodontal disease progression (11). Behaviorally, stress may result in reduced oral hygiene practices, increased consumption of sugary foods, and higher rates of smoking or alcohol use, all of which negatively affect periodontal health (12,14).

Furthermore, prolonged stress may lead to what is described as “oral health fatigue,” where individuals become less motivated to maintain daily oral hygiene routines. This, combined with barriers such as limited access to dental care and financial constraints, contributes to the accumulation of dental plaque and progression of periodontal disease (15,13). If untreated, periodontal inflammation may advance to alveolar bone loss, ultimately resulting in tooth mobility and loss (16). Given these considerations, it is essential to investigate the factors influencing periodontal health among university students, particularly the roles of stress and oral hygiene practices. Understanding these relationships is critical for developing effective preventive strategies and targeted interventions that address both psychological and behavioral determinants of oral health in this population (17). Therefore, this study aims to evaluate the association between stress levels, oral hygiene behaviors, and the prevalence of periodontal disease among university students. Such insights may contribute to improving oral health outcomes and promoting preventive measures within this vulnerable group.

2. Material and methods

2.1 Study Design and Population:

This cross-sectional study was conducted among 675 Libyan university students aged 18–30 years from various academic disciplines to investigate the relationship between stress, oral hygiene practices, and periodontal disease prevalence. The study sample was proportionally distributed across three major universities in Libya, including the University of Benghazi, the University of Tripoli, and the University of Sirte, to ensure geographic representation. Data were collected over a period of one year, from 2024 to 2025.

2.2 Ethical Considerations:

Ethical approval for this study was obtained from the Research Ethics Committee of Sirte University, Libya (Ethical approval number is 02.054.2026). Participants were informed about the study objectives, ensured confidentiality of their responses, and were given the right to withdraw from the study at any time

2.3 Data Collection:

Data were collected using a structured, self-administered questionnaire distributed both in person and online. The questionnaire was developed in Arabic to ensure clarity and included the following sections: Demographics: Age, gender, and year of study Oral Hygiene Practices: Frequency of toothbrushing, flossing, mouthwash use, and dental visits (adapted from the WHO Oral Health Questionnaire for Adults) Perceived Stress: Assessed using the Perceived Stress Scale (PSS-10), where each item is scored from 0 to 4, with a total score ranging from 0 to 40 Periodontal Health: Self-reported symptoms including gum bleeding, swelling, tooth mobility, and previous periodontal diagnosis Inclusion: Students aged 18–30 years who provided informed consent Exclusion: Students with systemic conditions affecting oral health, those undergoing orthodontic treatment, and incomplete responses

2.4 Sample Size:
A total of 675 participants were included to ensure adequate statistical power at a 95% confidence level.

2.5 2.5 Statistical Analysis:
Data were analyzed using IBM SPSS Statistics version 28. Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize the data. The **Chi-square test** was applied to assess associations between categorical variables, including stress levels, oral hygiene practices, smoking status, and periodontal disease. A p-value of < 0.05 was considered statistically significant

Result

A total of 675 university students participated in this study. **Table 1** summarizes the demographic characteristics, smoking status, and stress levels of the respondents.

Table 1: Demographic Characteristics , smoking status and stress level assessment of Participants

Characteristic	Frequency (n = 675)	Percentage (%)
Age Group (years)		
18–22	320	47.4%
23–27	355	52.6%
Gender		
Male	300	44.4%
Female	375	55.6%
Smoking Status		
Smoker	180	26.7%
Non-smoker	495	73.3%

3.2 Oral Hygiene Practices and Periodontal Disease Prevalence

Among participants, 68% (n = 459) reported brushing their teeth at least twice daily, while 32% (n = 216) reported brushing once or less per day. Daily flossing was reported by 35% (n = 236) of participants. Based on self-reported periodontal symptoms, 50% (n = 338) of participants reported signs consistent with gingivitis, while 23% (n = 155) reported symptoms suggestive of periodontitis. The overall prevalence of periodontal disease (gingivitis and/or periodontitis) was 73% (n = 493).

Table 2: Oral Hygiene Practices and Periodontal Disease Prevalence Among Participants (n = 675)

Variable	Category	Frequency (n)	Percentage (%)
Toothbrushing Frequency	≥ Twice daily	459	68
	≤ Once daily	216	32
Flossing Habit	Daily flossing	236	35
	No daily flossing	439	65
Periodontal Condition	Gingivitis (self-reported)	338	50
	Periodontitis (self-reported)	155	23
	Overall periodontal disease	493	73

3.3 Association Between Stress Levels and Oral Hygiene Practices

A statistically significant association was observed between stress levels and oral hygiene practices (**Chi-square test of association, $p < 0.05$**). Participants with higher stress levels demonstrated a greater prevalence of inadequate oral hygiene behaviors, including infrequent toothbrushing, lack of flossing, and irregular dental visits.

Table 3. Association Between Stress Levels and Oral Hygiene Practices

Stress Level	Brushing <2/day n (%)	No Flossing n (%)	No Dental Visit (6 months) n (%)
Low (n = 190)	40 (21%)	47 (25%)	57 (30%)
Moderate (n = 290)	93 (32%)	116 (40%)	130 (45%)
High (n = 195)	88 (45%)	101 (52%)	117 (60%)

3.4 Stress Levels and Periodontal Disease

A statistically significant association was found between stress levels and periodontal disease prevalence (**Chi-square test, $p < 0.01$**). The prevalence increased with stress level:

- High stress: 65% (n = 127)
- Moderate stress: 45% (n = 131)
- Low stress: 35% (n = 67)

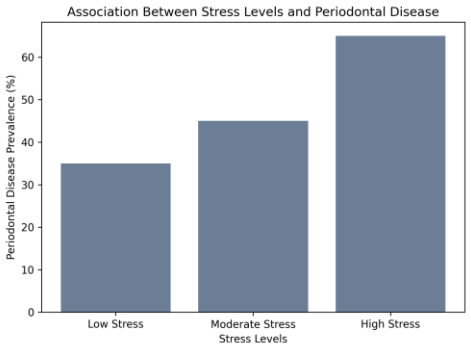

Figure1 .Showing assiacted between stress level and peridonatl diseses

3.5 Smoking and Periodontal Disease

A statistically significant association was observed between smoking status and periodontal disease (Chi-square test of association, $p < 0.05$). Smokers demonstrated a higher prevalence of periodontal disease compared to non-smokers (70% vs 45%, respectively). These findings suggest that smoking may be a significant risk factor for periodontal disease among the studied population.

Table 4: Association Between Smoking Status and Periodontal Disease

Smoking Status	Periodontal Disease n (%)	No Periodontal Disease n (%)

Smoker (n = 180)	126 (70%)	54 (30%)
Non-smoker (n = 495)	212 (45%)	283 (55%)

3 Discussion

The present study investigated the association between perceived stress, oral hygiene practices, smoking, and periodontal disease among Libyan university students. The findings demonstrated a high prevalence of periodontal disease and highlighted significant associations between behavioral and psychological factors and periodontal health. A key finding of this study was the high overall prevalence of self-reported periodontal disease (73%), with 50% of participants reporting gingivitis and 23% reporting symptoms suggestive of periodontitis. This prevalence is consistent with previous studies conducted among university populations, which have reported a high burden of periodontal conditions, often attributed to inadequate oral hygiene practices and limited preventive care utilization (21). Similar findings have been reported in studies where young adults exhibited poor oral hygiene behaviors despite having adequate knowledge of oral health (20). In terms of oral hygiene practices, although 68% of participants reported brushing at least twice daily, only 35% practiced daily flossing. This indicates a gap between basic oral hygiene practices and comprehensive plaque control. Comparable studies have also shown that while toothbrushing is relatively common among students, interdental cleaning practices remain insufficient, contributing to increased periodontal risk (21). The present study also demonstrated a significant association between stress levels and oral hygiene behaviors. Participants with higher stress levels were more likely to report inadequate oral hygiene practices, including reduced toothbrushing frequency, lack of flossing, and irregular dental visits. These findings are in agreement with previous research suggesting that psychological stress negatively impacts health-related behaviors, including oral hygiene (18,19). Stress may lead to neglect of self-care practices and unhealthy coping mechanisms, which in turn contribute to poor oral health outcomes. Furthermore, a strong association was observed between stress levels and periodontal disease prevalence. The prevalence increased progressively from 35% in low-stress individuals to 65% in those with high stress. This finding is consistent with existing literature that identifies stress as a significant risk factor for periodontal disease (18,19,25). Biological mechanisms, such as stress-induced immunosuppression and increased inflammatory responses, may explain this relationship (24). However, some studies have reported weaker or non-significant associations, suggesting that the effect of stress may vary depending on population characteristics and measurement methods (19). Additionally, the combined effect of smoking and high stress resulted in the highest prevalence (75%), suggesting a possible synergistic interaction between behavioral and psychological risk factors. Similar interactions have been reported in previous studies, where multiple risk factors compound the severity of periodontal conditions (22,23,24). Despite the strengths of this study, several limitations should be acknowledged. First, the cross-sectional design limits the ability to establish causal relationships between stress, oral hygiene practices, and periodontal disease. Second, the use of self-reported data may introduce reporting bias, as participants may overestimate positive behaviors such as toothbrushing. Third, no clinical examination was conducted to confirm periodontal status, which may affect the accuracy of disease classification. Additionally, the use of convenience sampling may limit the generalizability of the findings to the wider population. The findings of this study have important public health and clinical implications. They highlight the need for targeted oral health promotion programs among university students, focusing not only on improving oral hygiene practices but also on addressing psychological factors such as stress. Integrating stress management strategies into oral health education programs may enhance overall health outcomes. Furthermore, smoking cessation interventions should be emphasized as part of comprehensive periodontal disease prevention strategies. Future studies should consider longitudinal designs to better understand causal relationships between stress and periodontal disease. Clinical periodontal examinations should be included to improve diagnostic accuracy. Additionally, further research is needed to explore the combined effects of multiple risk factors, including stress, smoking, diet, and socioeconomic status. Intervention-based studies evaluating the effectiveness of stress reduction and behavioral modification programs on periodontal health are also recommended.

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Conflict of interest.

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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